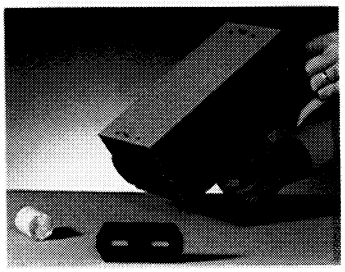

In mineral exploration, clues to the presence of precious metal deposits are obtained by analyzing rocks and soil to identify and quantify the specific minerals in the sample. There are a number of ways of effectively conducting such analyses, but they take time, are often costly and require use of a well-equipped laboratory. Barringer Research Limited, Rexdale, Ontario, Canada has designed, tested and is preparing to introduce to the commercial market a cost-effective, portable system—called Claypak—for rapid on-site analysis of clay minerals.

Claypak is an adaptation of Barringer's Hand Held Ratioing Radiometer (HHRR), which the company manufactures under NASA license. The HHRR was originally developed by Jet Propulsion Laboratory for "ground truthing," making on-the-spot examinations of ground targets as a means of verifying remotely-sensed data reported by NASA's Landsat satellites.

A radiometer is an instrument for measuring the intensity of reflected radiation as a means of discriminating among classes of visually-similar objects or, in mineral study, discriminating among different minerals present in a sample. The term "ratioing" describes an added capability of the Barringer HHRR: the system simultaneously analyzes radiation intensities in two separate bands of the spectrum and calculates the ratio of one to the other. This affords more positive identification of the material being analyzed. Computer-processed and displayed in digital form, the "reflectance ratio" enables analysts to determine the particular characteristics of the target. Ratioing radiometers have application in such areas as agriculture, water quality studies and determining pollution effect on forest cover.

The Claypak is a special version of the HHRR for use as an aid to precious metal exploration: it offers on-site identification and quantification of such clay minerals as kaolinite, illite, illite/smectite, chlorite, muscovite and biotite. In tests of more than 50 rock and soil samples from Alberta, Saskatchewan, Ontario and Nevada, the Claypak system correctly determined the mineral grouping in 94 percent of the cases wherein a mineral was present in a quantity greater than 10 percent. At upper left, the Claypak HHRR is shown in a simulation of a sample analysis; at left is the data processor, at right (blue box) the HHRR. The unit atop the HHRR is a portable artificial light source, needed in clay analysis because the system uses a region of the spectrum just outside of natural light wavelengths. At lower left, the black, masklike object is an accessory called the Core Viewing Attachment (CVA), used in analysis of small, drilled core subsurface samples such as the one pictured at left. The CVA clips over the radiometer's "eyes," causing it to "squint": this allows closeup measurements at a distance of 30 centimeters rather than the usual distance of more than 100 centimeters. ▲